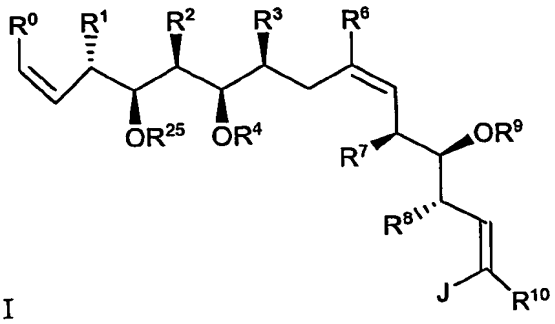
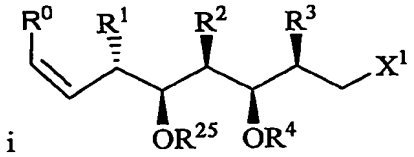
What is Claimed:

1. A process for synthesizing a compound of formula I



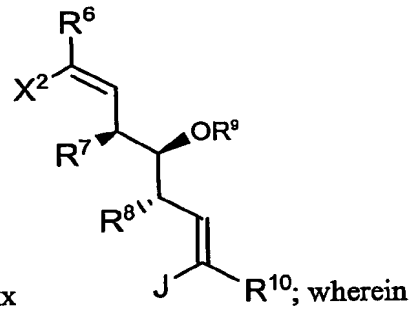
I

comprising contacting a compound of formula i



i

with a compound of formula xx



xx ; wherein

R^0 is C_{1-6} alkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, $(CH_2)_r(C_{3-6}$ cycloalkyl), $(CH_2)_r$(aryl) or $(CH_2)_r$(heterocycle), wherein r is 0, 1, 2, 3, or 4;

R^1, R^2, R^3, R^6, R^7, and R^8 are, independently, H or C_1-C_{10} alkyl;

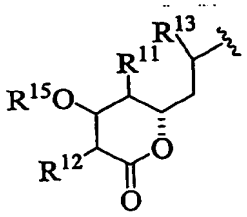
R^4 and R^9 are, independently, H or an acid labile hydroxyl protecting group;

R^{10} is hydrogen or C_1-C_6 alkyl;

R^{25} is hydrogen or an oxidation labile hydroxyl protecting group;

X^1 and X^2 is, independently, a halogen, triflate, tosylate, or mesylate; and

J is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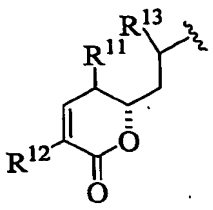
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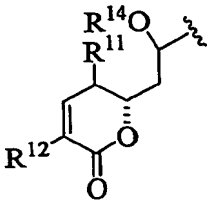
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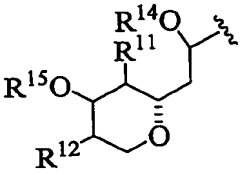
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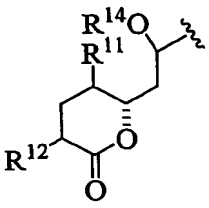
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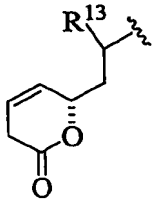
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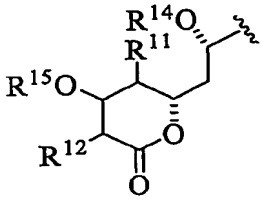
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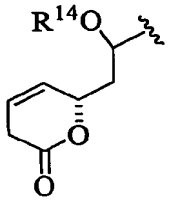
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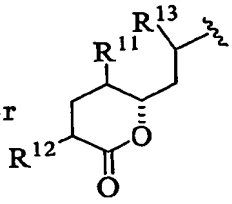
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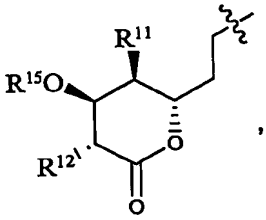
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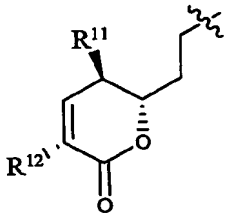
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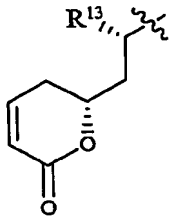
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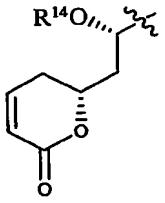

; wherein

R^{11}, R^{12} and R^{13} are each independently H or C_1-C_{10} alkyl; and

R^{14} and R^{15} are, independently, H or an acid labile hydroxyl protecting group.

2. The process of claim 1, further comprising

subjecting the process to a catalytically effective amount of a cross-coupling metal catalyst.

3. The process of claim 2, wherein the cross-coupling metal catalyst comprises nickel or palladium.

4. The process of claim 2, wherein the cross-coupling metal catalyst is Pd(0).

5. The process of claim 2, further comprising contacting the compound of formula i with a metallating agent, wherein the metallating agent is a compound containing boron, zinc, tin, magnesium, or aluminum, or a combination thereof.

6. The process of claim 5, wherein the metallating agent is a compound containing boron.

7. The process of claim 5, wherein the metallating agent is MeO-9-BBN.

8. The process of claim 5, wherein the metallating agent is a compound containing zinc.

9. The process of claim 5, wherein the metallating agent is $ZnCl_2$.

10. The process of claim 1, wherein at least one of X^1 and X^2 are iodo.

11. The process of claim 1, wherein R^0 is ethylenyl.

12. The process of claim 1, wherein R^1, R^2, R^3, R^6, R^7, and R^8 are, independently, H or C_1-C_3 alkyl.

13. The process of claim 1, wherein R^1, R^2, R^3, R^6, R^7, and R^8 are CH_3.

14. The process of claim 1, wherein R^4 and R^9, independently, are *tert*-butyldimethylsilyl, triethylsilyl, methoxymethyl, methylthiomethyl, 2-methoxyethoxymethyl, acetyl, benzyloxymethyl, 2-(trimethylsilyl)ethoxymethyl or allyl.

15. The process of claim 1, wherein R^4 is *tert*-butyldimethylsilyl.

16. The process of claim 1, wherein R^9 is methoxymethyl.

17. The process of claim 1, wherein R^{10} is CH_3.

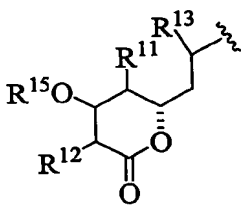
18. The process of claim 1, wherein R^{11}, R^{12} and R^{13} are CH_3.

19. The process of claim 1, wherein R^{14} and R^{15} are, independently, *tert*-butyldimethylsilyl, triethylsilyl, methoxymethyl, methylthiomethyl, 2-methoxyethoxymethyl, acetyl, benzyloxymethyl, 2-(trimethylsilyl)ethoxymethyl or allyl.

20. The process of claim 1, wherein R^{14} and R^{15} are, independently, *tert*-butyldimethylsilyl or methoxymethyl.

21. The process of claim 1, wherein R^{25} is *para*-methoxybenzyl.

22. The process of claim 1, wherein J is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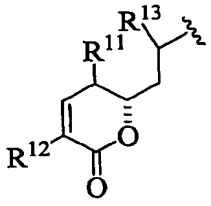
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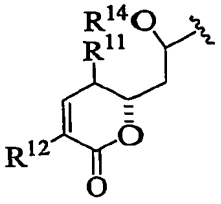
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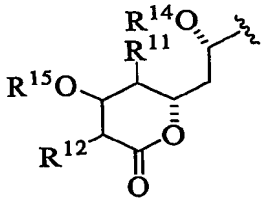
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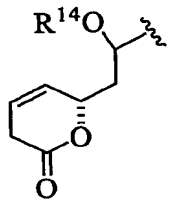
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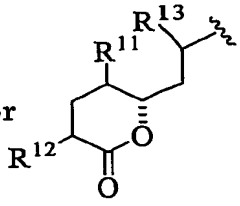
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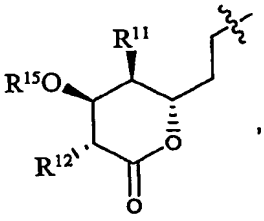
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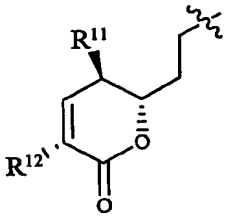
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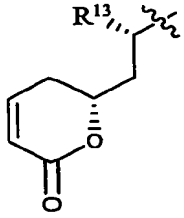
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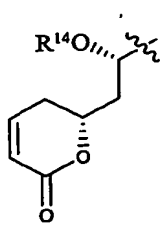
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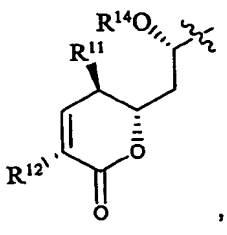
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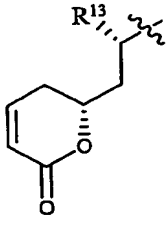
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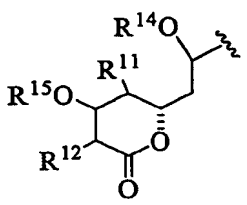
23. The process of claim 1, wherein J is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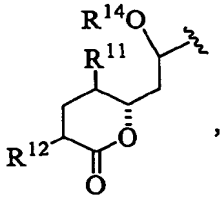
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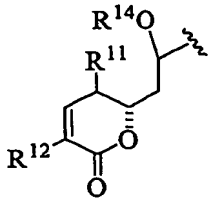
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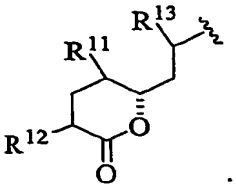
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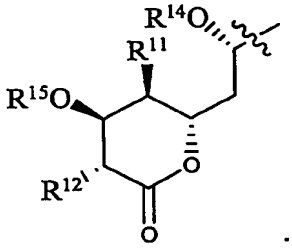
24. The process of claim 1, wherein J is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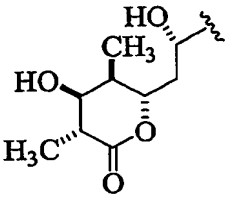
25. The process of claim 1, wherein J is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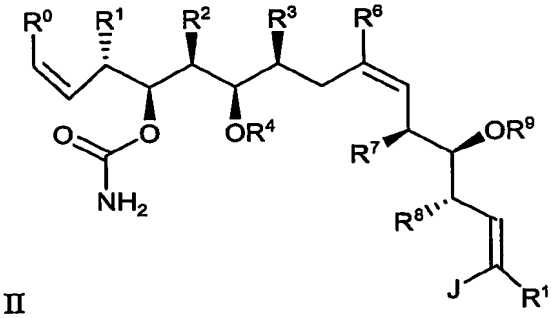
26. The process of claim 1, further comprising a step of synthesizing a compound of formula II



II from compound I, which comprises

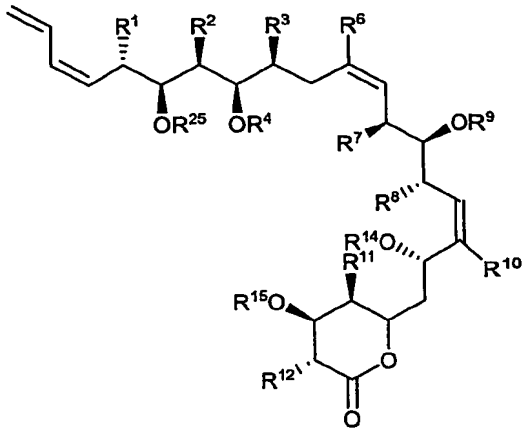
contacting the compound of formula I with an oxidizing agent to form a deprotected compound, and

contacting the deprotected compound with $Cl_3CCONCO$ in the presence of a hydrolyzing agent.

27. The process of claim 26, wherein the oxidizing agent is 2,3-dichloro-5,6-dicyano-1,4-benzoquinone.

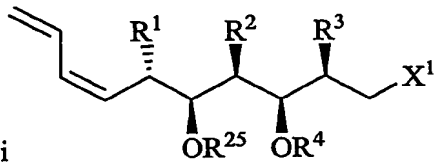
28. The process of claim 26, wherein the hydrolyzing agent is Al_2O_3.

29. A process for synthesizing a compound of formula III



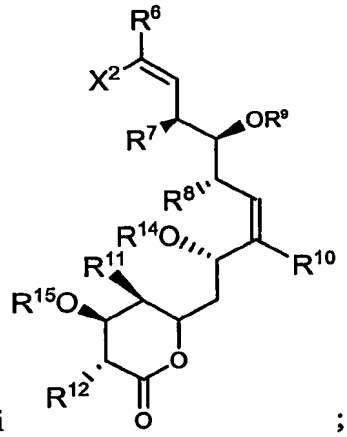
III

comprising contacting a diene of formula xi



xi

with a lactone of formula xxi



xxi ;

wherein R^1, R^2, R^3, R^6, R^7, R^8, R^{11}, and R^{12} are, independently, H or C_1-C_{10} alkyl;

R^4, R^9, R^{14}, and R^{15} are, independently, an acid labile hydroxyl protecting group;

R^{10} is hydrogen or C_1-C_6 alkyl;

R^{25} is hydrogen or an oxidation stable hydroxyl protecting group; and

X^1 and X^2 are, independently, a halogen, triflate, tosylate, or mesylate.

30. The process of claim 29, further comprising

subjecting the process to the presence of a catalytically effective amount of a cross-coupling metal catalyst.

31. The process of claim 29, wherein the cross-coupling metal catalyst comprises nickel or palladium.

32. The process of claim 29, wherein the cross-coupling metal catalyst is Pd(0).

33. The process of claim 29, further comprising contacting the compound of formula xi with a metallating agent, wherein the metallating agent is a compound containing boron, zinc, tin or magnesium or aluminum.

34. The process of claim 33, wherein the metallating agent is a compound containing boron.

35. The process of claim 33, wherein the metallating agent is MeO-9-BBN.

36. The process of claim 36, wherein the metallating agent is a compound containing zinc.

37. The process of claim 33, wherein the metallating agent is $ZnCl_2$.

38. The process of claim 29, wherein at least one of X^1 and X^2 are iodine.

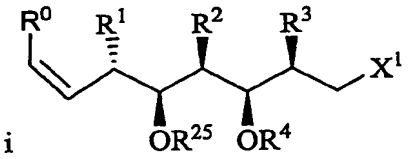
39. The process of claim 29, wherein R^1, R^2, R^3, R^6, R^7, R^8, R^{11}, and R^{12} are methyl.

40. The process of claim 29, wherein R^4, R^9, R^{14}, and R^{15} are, independently, *tert*-butyldimethylsilyl or methoxymethyl.

41. The process of claim 29, wherein R^{10} is hydrogen.

42. The process of claim 29, wherein R^{25} is *para*-methoxy benzyl.

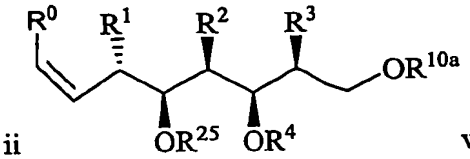
43. A process for synthesizing a halogenated alkylene of formula i



i

comprising:

contacting an alkenyl of formula ii



ii with a mild acid; and

adding to the process $(X^1)_2$ in the presence of $P(R^{18})_3$; wherein:

R^0 is C_{1-6} alkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, $(CH_2)_r(C_{3-6}$ cycloalkyl), $(CH_2)_r$(aryl) or $(CH_2)_r$(heterocycle), wherein r is 0, 1, 2, 3, or 4;

R^1, R^2, and R^3 are, independently, H or C_1-C_{10} alkyl;

R^4 is H or an acid labile hydroxyl protecting group;

R^{10a} is a hydroxyl protecting group;

R^{18} is C_6-C_{14} aryl;

R^{25} is hydrogen or an oxidatively labile hydroxyl protecting group; and

X^1 is a halogen, triflate, tosylate, or mesylate.

44. The process of claim 43 wherein R^0 is ethylene.

45. The process of claim 43 wherein R^1, R^2 and R^3 are each methyl.

46. The process of claim 43 wherein R^4 is *para*-methoxybenzyl.

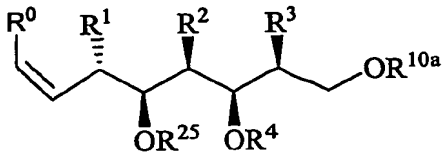
47. The process of claim 43 wherein R^{18} is phenyl.

48. The process of claim 43 wherein R^{25} is *tert*-butyldimethylsilyl.

49. The process of claim 43 wherein X^1 is iodo.

50. The process of claim 43, wherein R^{10a} is trityl.

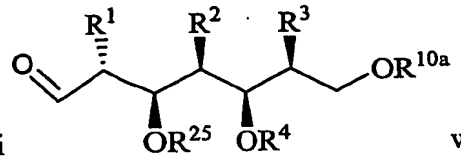
51. A process of synthesizing a compound of formula ii



ii

comprising:

contacting an aldehyde of formula iii



iii with $R^0CH{=}P(R^{18})_3$;

wherein

R^0 is C_{1-6} alkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, $(CH_2)_r(C_{3-6}$ cycloalkyl), $(CH_2)_r$(aryl) or $(CH_2)_r$(heterocycle), wherein r is 0, 1, 2, 3, or 4;

R^1, R^2, and R^3 are, independently, H or C_1-C_{10} alkyl;

R^4 is H or an acid labile hydroxyl protecting group;

R^{10a} is a hydroxyl protecting group;

R^{18} is R^{18} is C_6-C_{14} aryl; and

R^{25} is hydrogen or an oxidatively labile hydroxyl protecting group.

52. The process of claim 51 wherein R^0 is ethylene.

53. The process of claim 51 wherein R^1, R^2 and R^3 are each methyl.

54. The process of claim 51 wherein R^4 is *para*-methoxybenzyl.

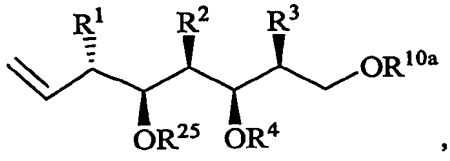
55. The process of claim 51 wherein R^{18} is phenyl.

56. The process of claim 51 wherein R^{25} is *tert*-butyldimethylsilyl.

57. The process of claim 51, wherein R^{10a} is trityl.

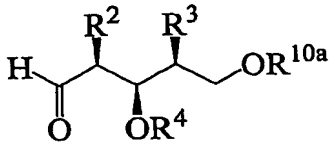
58. The process of claim 52, wherein the compound of formula iii is contacted with allyldiphenylphosphine instead of $R^0CH{=}P(R^{18})_3$.

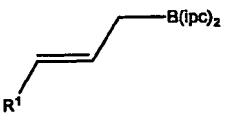
59. A process of synthesizing a compound of formula iv



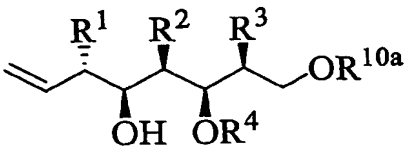
iv , comprising

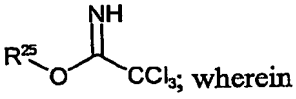
contacting a compound of formula vi


vi


with to form a compound of

formula v


v , and

reacting a compound of formula v with  wherein

R^1, R^2, and R^3 are, independently, H or C_1-C_{10} alkyl;

R^4 is H or an acid labile hydroxyl protecting group;

R^{10a} is a hydroxyl protecting group; and

R^{25} is hydrogen or an oxidatively labile hydroxyl protecting group.

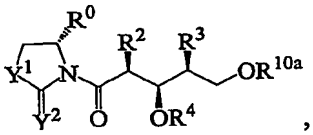
60. The process of claim 59 wherein R^1, R^2 and R^3 are each methyl.

61. The process of claim 59 wherein R^4 is *para*-methoxybenzyl.

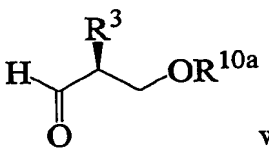
62. The process of claim 59 wherein R^{25} is *tert*-butyldimethylsilyl.

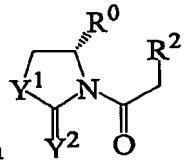
63. The process of claim 59, wherein R^{10a} is trityl.

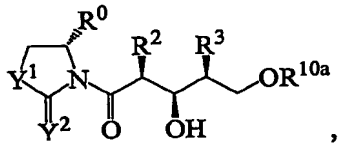
64. A process of forming a compound of formula viii


viii , comprising

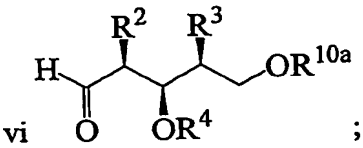
contacting a compound of formula x


x


with to form a compound of formula


ix , and

converting the compound of formula ix to a compound of formula vi



vi ; wherein

R^0 is C_{1-6} alkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, $(CH_2)_r(C_{3-6}$ cycloalkyl), $(CH_2)_r$(aryl) or $(CH_2)_r$(heterocycle), wherein r is 0, 1, 2, 3, or 4;

R^2 and R^3 are, independently, H or C_1-C_{10} alkyl;

R^4 is H or an acid labile hydroxyl protecting group;

R^{10a} is a hydroxyl protecting group; and

Y^1 and Y^2 are, independently, O or S.

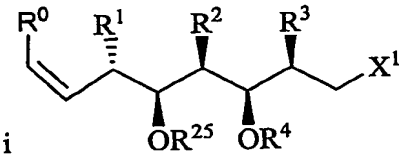
65. The process of claim 64 wherein R^0 is benzyl.

66. The process of claim 64 wherein R^2 and R^3 are each methyl.

67. The process of claim 64 wherein R^4 is *para*-methoxybenzyl.

68. The process of claim 64 wherein R^{10a} is trityl.

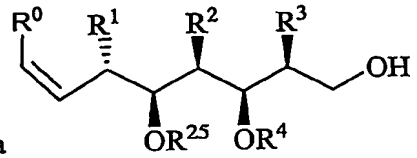
69. A process for synthesizing a halogenated alkylene of formula i



i

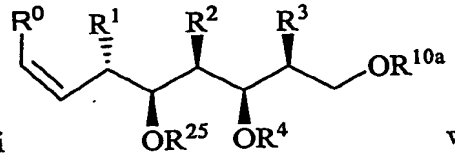
comprising,

contacting an alcohol of formula iia



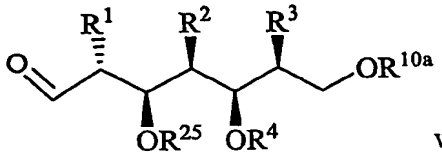
iia with $(X^1)_2$ in the presence of $P(R^{18})_3$;

yielding the compound of formula iia by contacting an alkylene of formula ii



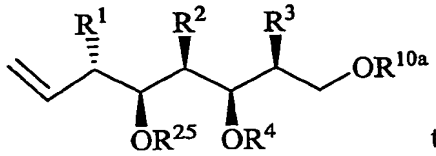
ii with a mild acid;

forming the compound of formula ii by contacting an aldehyde of formula iii



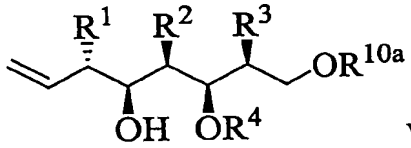
iii with $R^0CH_2—P(R^{18})_3X^1$;

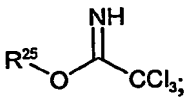
producing the compound of formula iii by subjecting a compound of formula iv



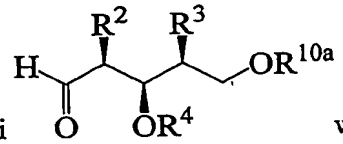
iv to ozonolysis.;

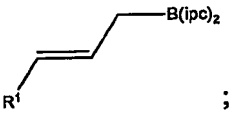
resulting in the compound of formula iv by contacting a compound of formula v



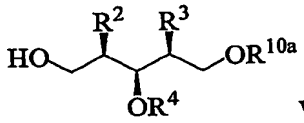
v with  ;

synthesizing the compound of formula v by contacting a compound of formula vi



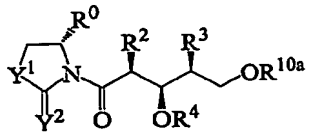
vi with  ;

producing the compound of formula vi by contacting a compound of formula vii



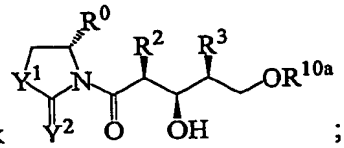
vii with an oxidizing agent;

forming the compound of formula vii by contacting a compound of formula viii

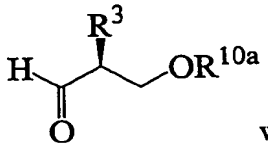
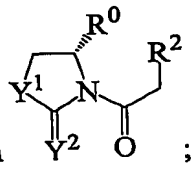


viii with a reducing agent;

synthesizing the compounds of formula viii and by protecting a hydroxyl moiety of a compound of formula ix


ix ; and

yielding the compounds of formula ix and ix′ by contacting a compound of formula x


x with 
; wherein

R^0 is C_{1-6} alkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, $(CH_2)_r(C_{3-6}$ cycloalkyl), $(CH_2)_r$(aryl) or $(CH_2)_r$(heterocycle), wherein r is 0, 1, 2, 3, or 4;

R^1, R^2, and R^3 are, independently, H or C_1-C_{10} alkyl;

R^4 is H or an acid labile hydroxyl protecting group;

R^{10a} is a hydroxyl protecting group;

R^{18} is C_6-C_{14} aryl;

R^{25} is hydrogen or an oxidatively labile hydroxyl protecting group;

X^1 is a halogen, triflate, tosylate, or mesylate; and

Y^1 and Y^2 are, independently, S or O.

70. The process of claim 69 wherein R^0 is benzyl.

71. The process of claim 69 wherein R^1, R^2 and R^3 are each methyl.

72. The process of claim 69 wherein R^4 is *para*-methoxybenzyl.

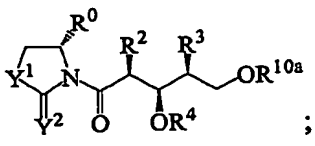
73. The process of claim 69 wherein R^{18} is phenyl.

74. The process of claim 69 wherein R^{25} is *tert*-butyldimethylsilyl.

75. The process of claim 69 wherein X^1 is iodo.

76. The process of claim 69, wherein R^{10a} is trityl.

77. A compound of formula viii


viii ;

wherein

R^0 is C_{1-6} alkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, $(CH_2)_r(C_{3-6}$ cycloalkyl), $(CH_2)_r$(aryl) or $(CH_2)_r$(heterocycle), wherein r is 0, 1, 2, 3, or 4;

R^2 and R^3 are, independently, H or C_1-C_{10} alkyl;

R^4 is H or an acid labile hydroxyl protecting group;

R^{10a} is a hydroxyl protecting group; and

Y^1 and Y^2 are, independently, S or O.

78. The compound of claim 77 wherein R^0 is benzyl.

79. The compound of claim 77 wherein R^2 and R^3 are each methyl.

80. The compound of claim 77 wherein R^4 is *para*-methoxybenzyl.

81. The compound of claim 77 wherein R^{10a} is trityl.

82. The compound of claim 77 wherein at least one of Y^1 and Y^2 is S.

83. The compound of claim 77 wherein at least one of Y^1 and Y^2 is O.